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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/729,834	12/05/2003	Gary R. Holt	10006.001710	8546

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EXAMINER	
WERNER, DAVID N	

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2621	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/729,834	HOLT ET AL.	
	Examiner	Art Unit	
	David N. Werner	2621	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *08 August 2007*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *2-6 and 8-12* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *2-6 and 8-12* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *19 July 2007* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

1. This Office action is in response to communications filed 08 August 2007, in reply to the Non-Final Rejection of 30 April 2007. In the previous Office action, claims 1, 3, 6, and 7 were rejected under 35 U.S.C. 102(b) as anticipated by "Motion Compensated Enhancement of Noisy Image Sequences" (Kalivas et al.), claims 2 and 8-10 were rejected under 35 U.S.C. 103(a) as obvious over Kalivas et al. in view of "Double-Window Hodges-Lehman (D) Filter and Hybrid D-Median Filter for Robust Image Smoothing" (Kundu et al.), and in view of European Patent Application Publication 1,100,260 A1 (Borneo et al.), claims 4 and 11 were rejected under 35 U.S.C. 103(a) as obvious over Kalivas et al., and claims 5 and 12 were rejected under 35 U.S.C. 103(a) as obvious over Kalivas et al. in view of US Patent 5,544,239 A (Golin et al.) In addition, the drawings were objected to on formalities.

Currently, claims 2-6 and 8-12 are pending. Claims 1 and 7 have been cancelled.

Drawings

2. Replacement drawings were received on 19 July 2007. These drawings are acceptable.

Response to Arguments

3. Applicant's arguments with respect to claim 2 have been considered but are moot in view of the new ground(s) of rejection. Applicant argues that none of the cited prior art discloses the newly added claim limitations of determining segments that are no longer adjacent to a segment boundary based on motion estimation, and reducing the impact of color blur from these segments.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claims 2-4, 6, and 8-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kalivas et al., in view of US Patent 5,646,691 A (Yokoyama), and in view of Borneo et al. Kalivas et al. teaches a noise compensation algorithm. Regarding claims 2, 6, and 8, equation 15 of Kalivas et al. gives a motion compensated spatiotemporal filter, and equation 16 gives a spatiotemporal mean filter. Regarding the "object motion estimation for arbitrarily shaped segments" to align pixels, between a frame at time k and at time k+1, the motion of an object pixel is given according to a linear model (§ 2.2). A frame is segmented according to object indicator function λ, where for a given pixel (i, j) at frame k, $\lambda(i, j, k)$ is set to 1 if the pixel is in the object, and 0 if not (§ 2.1). Then, object indicator function λ serves as a weighing function. The

segmentation model can be modified for multiple objects (equation 3). Regarding the "weighted average", in the spatiotemporal mean filter, the average of pixel values g(l, m, n) is then taken over region L in space-time window (Wni, Wnj, T), centered on point (in, jn) at time k. L is only counted in the region in which for a certain object, λ(l, m, n) is defined (§ 4.2). However, Kalivas et al. does not take into account boundary regions.

Yokoyama teaches a motion compensation system. In a first embodiment, Yokoyama places on an image a net containing a set of "representative points", and a set of "boundary lines". These boundary lines form the boundaries of "segments" with the "representative points" as vertices (column 8: lines 5-11). Yokoyama also includes a means for detecting "contour lines", corresponding with the "segment boundaries" of the present invention (column 8: lines 11-13). Yokoyama reduces distortion in a motion compensated image by adjusting the "boundary lines" on the net to fit along these "contour lines" of various objects or regions in the image (column 8: lines 29-37). In a second embodiment, an evaluation process corrects both locations of the "representative points" and the "segment boundary lines" (column 9: lines 37-61).

Regarding claims 2 6, and 8, in the second embodiment of Yokoyama, the "representative points" and "segment boundaries" that are no longer on a "contour" between regions are shifted (column 10: lines 21-37). This corresponds with the claimed "determining segments that are no longer adjacent to a segment boundary". Remember that the "contours" of Yokoyama correspond with the "segment boundaries" of the present invention. The adjustment of representative points and boundary lines in

Yokoyama also corresponds with the step of "aligning pixels from a current frame with matching pixels from select neighboring frames" in claim 8.

Kalivas et al. teaches a majority of the claimed invention except for correcting motion compensation due to segment boundaries. Yokoyama teaches that it was known to determine if points on a contour line in an image have moved. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to update segment boundaries in a motion-compensated image, as taught by Yokoyama, since Yokoyama states in column 8: lines 29-37 that such a modification would reduce image distortion. However, in Yokoyama, pixels that are no longer on contour lines are merely interpolated, not given reduced weights (column 20: lines 26-44).

Kalivas et al, in combination with Yokoyama, discloses the claimed invention except for adjusting pixel weight in boundary regions. Borneo et al. teaches a spatiotemporal noise filtering method. Regarding claims 2, 6, and 8, Borneo et al. first chooses a working window composed of pixels near a selected pixel P [0049]. Then, pixels near the center of the window produce a weighted average [57] based on the distance from the pixel to the center of the window. (This is similar to the "energy" calculations in Yokoyama based on distance to a contour line.) The pixel at the window center itself may or may not contribute to the weighted average [0058]. Regarding adjusting weights in boundary regions, figure 4 of Borneo et al. shows a weighting function for pixels at threshold intervals of Th away from CENTERj, the center of the working window. The weights are halved at each threshold distance [0064]. Then, by

placing the working window at the center of an "object", or a "segment" therein, as determined by Yokoyama (figure 5), the areas not in the object have less weight, and so their blur is reduced.

Borneo et al. teaches that it was known to reduce pixel weight for pixels away from the center of a region in an image. Therefore, it would have been obvious to one having ordinary skill in the art at the time of the invention to adjust pixel weights outside of a region, as taught by Borneo et al, since Borneo et al. states in paragraph [0028] that such a modification would suppress noise peaks. Then, Kalivas et al. and Yokoyama, now incorporating the Borneo et al. adjusted-weight filter windows, satisfies every limitation of claim 2, 6, and 8.

Regarding claim 3, in Kalivas et al., in any exposed area in a given frame, that is, an area outside an object, weight λ is zero (§ 2.1), and so will not be counted in a temporal filter (§ 4.1).

Regarding claims 4 and 11, Kalivas et al. is silent about Groups of Pictures (GOPs). However, the examiner takes Official Notice that the limitation of "determining additional motion information across GOP boundaries is a well-known part of the MPEG standard. A GOP for which motion estimation can be taken across GOP boundaries is well known in the art as an "open GOP". It would have been obvious for one having ordinary skill in the art at the time the invention was made to include a filter on a video stream having open GOPs, since open GOPs allow for reduced bandwidth in an encoded image sequence.

Regarding claims 9 and 10, in Borneo et al., a "tail detect" block can be provided to suppress a "comet tail effect" that occurs when a weight factor is overestimated. A tail detection block may disable weighting pixels from a previous frame, or reduce their weights [0068].

6. Claims 5 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kalivas et al. in view of Yokoyama and Borneo et al. as applied to claims 1 and 8 above, and further in view of US Patent 5,544,239 A (Golin et al.). The above-cited art do not teach adjusting a temporal filter based on a lighting offset.

Golin et al. teaches a motion estimation method that compensates for a fading image. Regarding claims 5 and 12, Figure 1 of Golin et al. shows brightness adjustment unit 104, which calculates base image 106 by reducing pixels in an image by the average pixel brightness in the image and in the next image (column 2: lines 43-53). This is in response to fade detector 101, which stores the frame in a buffer if a sequence is fading (column 2: lines 25-42). Motion analysis unit 108 then determines displacement vectors between the current image and the previous base image (column 3: lines 16-15).

Kalivas, in combination with Yokoyama and Borneo et al., discloses the claimed invention except for calculating a lighting offset. Golin et al. teaches that it was known to calculate motion analysis in an image sequence based on images with adjusted brightness. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to add a brightness adjustment unit to a motion

analysis system as taught by Golin et al., since Golin et al. states in column 1, lines 41-55 that such a modification would increase accuracy of motion estimation.

Conclusion

7. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. US Patent 5,568,196 A (Hamada et al.) teaches a motion compensation system that applies a low-pass filter between a current frame and a reference frame to reduce blur. US Patent 5,912,991 A (Jeon et al.) teaches a contour encoding method for a motion compensator. US Patent 5,982,909 A (Erdem et al.) teaches a method for tracking an object in a moving image. US Patent 6,343,097 B2 (Kobayashi et al.) teaches a motion detection system that divides an image into groups of blocks each having a regional motion vector. US Patent 6,421,384 B1 (Chung et al.) teaches a motion estimation system that determines motion vectors for contours. US Patent 6,483,874 B1 (Panuspone et al.) teaches a motion estimation system for images encoded according to shape and texture. US Patent 6,660,786 B1 (Prakash et al.) teaches a video coder and decoder that transmits high-level "structural information" such as segmentation and "kinetic information" such as segment motion. US Patent Application Publication 2001/0026586 A1 (Katata et al.) teaches a motion picture coding and decoding system that processes different frames corresponding with different layers in an image. US Patent Application Publication 2002/0131495 A1 (Prakash et al.) teaches a method of reconstructing a newly exposed area in a video frame. US Patent Application Publication 2002/0141498 A1 (Martins et al.) teaches a video encoder that

encodes certain "regions of interest" of an image at higher quality than other regions. US Patent Application Publication 2003/0012277 A1 (Azuma et al.) teaches a system that separates an image into a foreground and a background. European Patent Application Publication 596,409 A2 (Etoh) teaches a motion vector estimation system specialized for working with object boundaries.

8. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to David N. Werner whose telephone number is (571) 272-

9662. The examiner can normally be reached on Monday-Friday from 8:30 AM - 5:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mehrdad Dastouri can be reached on (571) 272-7418. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

DNW